#5

S/N TO BE ASSIGNED PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	VERKAMA	Serial No.:	TO BE ASSIGNED
Filed:	17 APRIL 2001	Docket No.:	781.395USW1
Title:	MECHANISM FOR NETWORK-INITIATED INFORMATION TRANSFER		

CERTIFICATE UNDER 37 CFR 1.10
'Express Mail' mailing label number: EL 733010132 US
Date of Deposit: 17 April 2001
I hereby certify that this correspondence is being deposited with the United States Postal Service 'Express Mail Post Office To Addressee' service under 37 CFR 1.10 on the date indicated above and is addressed to the Assistant Commissioner for Patents, Washington, D.C . 20231.

By: Kari Arnold
Name: Kari Arnold

SUBMISSION OF PRIORITY DOCUMENT

Box Patent Application
Assistant Commissioner for Patents
Washington, D.C. 20231

Dear Sir:

Enclosed is a certified copy of Finnish application, Serial Number 982258, filed 19 October 1998, the priority of which is claimed under 35 U.S.C. §119.

Respectfully submitted,

Altera Law Group, LLC
6500 City West Parkway, Suite 100
Minneapolis, MN 55344-7701
952-912-0527

Date: 17 April 2001 By:

Michael B. Lasky
Reg. No. 29,555
MBL/mar

PATENTTI- JA REKISTERIHALLITUS
NATIONAL BOARD OF PATENTS AND REGISTRATION

Helsinki 15.3.2001

E T U O I K E U S T O D I S T U S
P R I O R I T Y D O C U M E N T

Hakija Applicant	**Nokia Telecommunications Oy** **Helsinki**
Patenttihakemus nro Patent application no	**982258**
Tekemispäivä Filing date	**19.10.1998**
Kansainvälinen luokka International class	**H04Q**

Keksinnön nimitys
Title of invention

"Mechanism for network-initiated information transfer"
(Mekanismi verkon aloittamaa informaation lähetystä varten)

Hakijan nimi on hakemusdiaariin **02.12.1999** tehdyn nimenmuutoksen jälkeen **Nokia Networks Oy.**

The application has according to an entry made in the register of patent applications on **02.12.1999** with the name changed into **Nokia Networks Oy.**

Täten todistetaan, että oheiset asiakirjat ovat tarkkoja jäljennöksiä patentti- ja rekisterihallitukselle alkuaan annetuista selityksestä, patenttivaatimuksista, tiivistelmästä ja piirustuksista.

This is to certify that the annexed documents are true copies of the description, claims, abstract and drawings originally filed with the Finnish Patent Office.

Marketta Tehikoski
Apulaistarkastaja

Maksu 300,- mk
Fee 300,- FIM

Osoite: Arkadiankatu 6 A
P.O.Box 1160
FIN-00101 Helsinki, FINLAND
Puhelin: 09 6939 500
Telephone: + 358 9 6939 500
Telefax: 09 6939 5328
Telefax: + 358 9 6939 5328

Mechanism for network-initiated information transfer

The invention relates to methods and equipment for providing network-initiated information transfer for terminals in a network supporting packet-switched communications. The invention is suitable for e.g. providing push services for mobile packet radio users. Push services are services the availability of which is informed to the client (subscriber) by the service provider or operator. Alternatively, the service provider or operator can deliver the service to the client.

Background of the invention

For providing new services, there are generally two major architectures: client-server and push services. Client-server architecture relies on the client's (i.e. the user's) activity for receiving new services. In contrast, with push service architecture, the user is at least informed of the availability of new services by the service provider or network operator. Instead of, or in addition to, merely informing the user, the service provider or network operator can actually download a new service or information to the user's terminal equipment.

Fig. 1 is a block diagram of a packet radio network, such as GPRS (General Packet Radio Service). The GPRS infrastructure comprises support nodes such as a GPRS gateway support node (GGSN) and a GPRS serving support node (SGSN). The main functions of a GGSN node involve interaction with the external data network. The GGSN updates the location directory using routing information supplied by the SGSNs about an MS's location and routes the external data network protocol packet encapsulated over the GPRS backbone to the SGSN currently serving the MS. It also decapsulates and forwards external data network packets to the appropriate data network and handles the charging of data traffic.

The main functions of the SGSN are to detect new GPRS mobile stations in its service area, handle the process of registering the new MSs along with the GPRS registers, send/receive data packets to/from the GPRS MS, and keep a record of the location of the MSs inside of its service area. The subscription information is stored in a GPRS register (Home Location Register HLR) where the mapping between a mobile station's identity (such as MSISDN or IMSI) and the PDP address is stored. The GPRS register acts as a database from which the SGSNs can ask whether a new MS in its area is allowed to join the GPRS network.

The GPRS gateway support nodes GGSN connect an operator's GPRS network to external systems, such as other operators' GPRS systems, data networks 11, such as an IP network (e.g. Internet) or an X.25 network, and service centres. Fixed hosts or servers 14 can be connected to data network 11 e.g. by means of a local area network LAN and a router 15. A border gateway BG provides an access to an inter-operator GPRS backbone network 12. The GGSN may also be connected directly to a private corporate network or a server. The GGSN contains GPRS subscribers' PDP addresses and routing information, i.e. SGSN addresses. Routing information is used for tunnelling protocol data units PDU from data network 11 to the current switching point of the MS, i.e. to the serving SGSN. The functionalities of the SGSN and GGSN may be located in the same physical node.

The home location register HLR of the GSM network contains GPRS subscriber data and routing information and it maps the subscriber's IMSI into one or more pairs of the PDP type and PDP address. The HLR also maps each PDP type and PDP address pair into a GGSN node. The SGSN has a Gr interface to the HLR (an SS7 signalling connection). The HLR of a roaming MS and its serving SGSN may be in different mobile communication networks.

The intra-operator backbone network 13, which interconnects an operator's SGSN and GGSN equipment can be implemented, for example, by means of a local area network. It should be noted that an operator's GPRS network can also be implemented without the intra-operator backbone network, e.g. by providing all features in one computer.

A general problem underlying the invention is that packet data users generally do not have permanent addresses, such as IP (IPv4 or IPv6) addresses. The reason is the limited address space of especially IPv4, which justifies the common practice of allocating IPv4 addresses to the user dynamically only when needed, and thus reusing the same address among different users. On the other hand, this practice makes provision of push services rather difficult.

A more specific problem can be seen in packet radio networks, such as GPRS, or in the 3rd generation systems, such as UMTS (Universal Mobile Telecommunications System). Such packet radio networks provide the user with a packet data protocol (PDP) address which can be used for routing packets to/from a mobile station in the network currently serving the user. This

network may be a visited network VPLMN (Visited Public Land based Mobile Network), i.e. a network different from the user's home network HPLMN (Home PLMN). The PDP address can be an IP address or an X.25 address or equivalent. The PDP address may be static or dynamically allocated by the serving network. In the first case, the GGSN is located in the home network, whereas in the latter case the GGSN in the visited network can be used. The specific problem is that in the case of dynamic PDP address allocation, only the serving network knows the user's PDP address, such as the user's current IP address (or any other address). This is not a problem in client-server architectures, because the client (having the initiative) knows the server's address. In push service architectures, however, this is a problem, because the server/service provider does not know where to "push" new services or information about them.

Disclosure of the invention

An object of the invention is to provide mechanisms for providing push services in a packet radio system. In other words, the invention should solve, or at least minimise, the problems associated with the prior art push service mechanisms. The object is achieved with a method and equipment which are characterized by what is disclosed in the attached independent claims. Preferred embodiments of the invention are disclosed in the attached dependent claims.

The invention is based on locating the problem and finding a solution for it. The solution is based on the vision that a packet radio network is supplemented with Intelligent Network (IN) technology. For a given area where the invention is to be implemented, the serving support nodes covering that area are operationally connected to an Intelligent Network node. The IN can be used as a data store for storing an address or identifier by which the mobile station can be reached. Preferably, such an address or identifier is the MS's PDP address. Within the context of the present application, the PDP address of a mobile station (MS) refers to any address, number or other identifier by which PDP packets may be routed to the MS.

While such a hybrid between a packet radio network and an intelligent network might seem desirable, implementing such a hybrid is far from obvious. IN standards have been created for wired connection-oriented telecommunications networks. Implementing IN functionality is problematic in a mobile telecommunications network wherein the mobile subscriber lacks a

fixed access point. Yet mobile subscribers subscribing to IN services should be identified everywhere in the mobile telecommunications network, and knowledge about their services should be maintained, etc. This easily leads to massive data files and/or a need for extensive data transfer within the mobile telecommunications network. For instance, in the GSM (Global System for Mobile Communication) system, maintaining a connection to the Service Control Point SCP of the IN is implemented so that when a subscriber moves from the area of one Mobile services Switching Centre (MSC), acting as an IN Service Switching Point SSP, to the area of another MSC, the original MSC remains a controlling anchor centre to which information about events in the new MSC are transferred using MAP protocol. In such a case, the connection to the IN SCP may remain in the original MSC. In contrast, a packet radio system, such as the GPRS system which is used as an example, lacks any anchor node which would correspond to an anchor centre, and the control over a packet data connection is moved when the subscriber moves from the area of a support node, acting as an IN SSP, to the area of another support node. In such an arrangement, a relevant problem is maintaining the states of the Service Logic Programs (SLP) of the IN SCP corresponding to the connection as the support node changes. Maintaining the states is essential in order for the original SLP to be able to control the packet data connection in a seamless manner, even though the subscriber is moving in the areas of different support nodes.

Reference 1 discloses one solution for this specific problem. However, reference 1 is not published at the priority day of the present application, and its main points are repeated here. 'Service connection' refers to a connection which is set up for the purpose of providing services. When the service connection is established between the IN SCP and a first SSP, an identifier is allocated to the service connection. When the subscriber moves from the area of one SSP to the area of another SSP, the identifier of the service connection is transferred from the old SSP to the new SSP, preferably with the address of the SCP and the state information of the SSP. By using the transferred data, a service connection is established from the new SSP to the SCP, whereby the SLP corresponding to the service connection is identified by means of the identifier of the service connection. Even if the support node serving the subscriber changes, the corresponding SLPs maintain their state information. Thus the same SLP can control the service connection for its entire duration,

although the service connection would have to be re-established because the SSP changes.

Using IN technology in a packet radio network poses another problem. The concept of IN technology is based on modelling a call with a Basic Call State Model (BCSM), but in a packet radio network there is no "call". Rather, packets are sent and received as necessary. Reference 2 discloses one solution for this specific problem, but reference 2 is not published at the priority day of the present application, and its main points are repeated here. Several IN concepts can be used, however, if an analogy of a BCSM is created, but instead of a call, the analogy model is used to model a session in a packet radio network. At least one event in a packet radio network should be defined as a trigger event which triggers a service request into a Service Control Point (SCP) of the IN.

At first sight, implementing IN technology seems to require extensive modifications in a packet radio network, considering that for the purposes of the present invention, the IN is only needed as a data store (or a front end to a data store) for storing an MS-related address or identifier. However, the invention is partly based on a vision that IN technology can be used for providing many other services besides delivering push services (such as advanced charging), and consequently, these extensive modifications can be justified.

According to a preferred embodiment of the present invention, the packet radio network is modified as follows. A suitable interface, such as an INAP (Intelligent Network Application Part) or CAP (Camel Application Part) interface is defined between a GPRS support node (preferably an SGSN node) and an Intelligent Network node. Preferably, such an IN node is a Service Control Point SCP of the IN. The address of the SCP is indicated e.g. in the user's subscriber data. The GPRS support node is programmed to inform the SCP of the PDP address allocated to the user e.g. upon a successful PDP context activation. This message sent to the SCP may also include other information, such as information about the QoS class related to the PDP context or location information. When the user detaches from the network, or when the PDP address is cancelled or reallocated, the SCP is notified again.

The SCP is programmed to maintain an association between a subscriber identity (e.g. IMSI) and the PDP address allocated to the user. A server providing a subscriber with a new push service sends an inquiry to the SCP.

The SCP responds by sending the PDP address of the user. The response can also include other data related to the PDP context, such as location information.

The invention can be used to implement push services including, but not limited to:

notification about current call tariffs,
notification about new messages in the user's mailbox,
notification about new messages in a voice processing system, and
notification about local facilities in the user's location area.

As an example, let us consider the case where the MS subscriber subscribes to a certain service, such as a weather forecast or stock market data. The server can actually provide the subscriber with the weather forecast or stock market data. Alternatively, the server may only inform the subscriber that a new forecast or new data is available. It is also possible to download executable program code, such as Java applets, or the like, to the MS.

Brief description of the drawings

The invention will be described in more detail by means of preferred embodiments with reference to the appended drawing on which:

Fig. 1 is a block diagram showing some elements of packet radio network which are essential for describing the invention; and

Figs. 2A and 2B are signalling diagrams illustrating different embodiments of the invention.

Detailed description of the invention

As shown in Fig. 1, the packet radio network is supplemented with Intelligent Network (IN) technology. The packet radio network is preferably modified as follows. An INAP (Intelligent Network Application Part) interface is defined between a GPRS support node (preferably an SGSN node) and the SCP of the IN. In other words, the support node is equipped with an IN Service Switching Function SSF. A network element having SSF functionality is called a Service Switching Point (SSP). The address of the SCP can be indicated in the user's subscriber data. A state model can be formed of the PDP context activation. (In circuit-switched networks, state models are generally used for modelling a call. In a packet-switched network, the concept of a "call" does not exist, but an analogy of a state model can be used for modelling e.g. a session which begins when the MS attaches to the network and ends when the MS

detaches from the network.) The support node with the SSP functionality, typically an SGSN/SSP node, is programmed to inform the SCP about the PDP address allocated to the user. When the user detaches from the network, or the PDP address is cancelled or reallocated, the SCP is notified again.

The SCP is modified as follows. It may comprise a proprietary interface (such as TCP/IP over Ethernet) to the server equipment for providing push services. A suitable Service Logic Program SLP is installed in the SCP. The purpose of this SLP is to create, maintain and delete an association between a mobile station's identity and its PDP address. A server, such as the server 14, providing a subscriber of the MS with a new push service sends an inquiry to the SCP. The SCP, using the SLP, responds by sending the PDP address of the MS.

Fig. 2A is a signalling diagram illustrating a preferred embodiment of the invention. In step 2-2, the MS sends an Attach Request to an SGSN node. In step 2-4, the network activates a PDP context for the MS. It should be noted that steps 2-2 and 2-4 normally comprise many different operations, such as authenticating the MS subscriber and sending an acknowledgement to the MS. However, for clarity, such routine operations are not shown separately. According to a preferred embodiment of the invention, the prior art activation procedure is modified so that in step 2-6, in response to the PDP context activation, the SGSN sends the SCP a start-up message for launching an IN service. In INAP terminology, the start-up message is called an IDP (INITIAL DETECTION POINT). Its parameters comprise a service key Skey for identifying the IN service, a subscriber identity IMSI, and the PDP address of the MS. The SCP, upon receiving the IDP with these parameters, executes the Service Logic Program SLP associated with Skey. This SLP creates and maintains an association between a MS/subscriber identity (such as the IMSI) and the corresponding PDP address.

Next, it is assumed that in step 2-8, the server 14 decides to inform the MS about a new or updated service. In step 2-10, it sends the SCP an inquiry concerning the PDP address of the MS. This inquiry is called PDP_ADDRESS_REQUEST and its parameters comprise the MS's IMSI. In step 2-12, the SCP replies by sending to the server the PDP address of the MS. The reply message is called PDP_ADDRESS_ACKNOWLEDGE. Finally, in step 2-14, the server 14 knows the MS's current PDP address and it can send a message addressed to the MS. For clarity, details of the routing of the mes-

sage 2-14 are not shown separately. Such routing can be performed by normal GGSN/SGSN functionality.

As an alternative, it is not necessary to route the message 2-14 via the GGSN node. Instead, the server 14, having a Gn interface, may be located in or connected to the operator's private backbone network 13 and the address information may include the MS's GTP tunnel identifier (TI) and SGSN address, in addition to the PDP address.

In the embodiment shown in Fig. 2A, the SCP is only used as a data store for storing the MS's PDP address. (Alternatively, if the MS's PDP address is stored in some external database, the SCP may be used as a front end to such a database.) An essential feature is that the server 14 does not have to keep track of the changing PDP addresses of individual mobile stations, and it is sufficient for the server to know the address of the SCP. Upon a successful PDP context activation or update, the SGSN node serving the MS informs the SCP of the PDP address allocated to the MS. Later, in step 2-10, the server sends the SCP an inquiry about the MS's PDP address, but actual push service or information about it are not routed via the SCP. The embodiment shown in Fig. 2A has the advantage that the server knows the MS's PDP address and bi-directional communications can be established between the server and the MS. However, the MS's PDP address discloses something of the MS's location and some subscribers might object to such a disclosure as trespassing on their privacy. According to an alternative embodiment shown in Fig. 2B, steps 2-10' to 2-12' are modified so that the actual push service or information about it are routed via the SCP. No messages for this purpose have been standardised, but step 2-12' is somewhat analogous to using CONNECTTORESOURCE and PLAYANNOUNCEMENT operations in a circuit-switched network. An advantage of this alternative embodiment is that no information about the MS's location is revealed to the server which might be outside the PLMN.

The description only illustrates preferred embodiments of the invention. Based on the above description, certain modifications are apparent to a skilled reader. For instance, according to yet another embodiment, the SCP may store information about servers providing push services to the users, and in response to receiving information about the current PDP address allocated to a certain user (such as activation or deactivation of the PDP address), the SCP sends this information to the servers (e.g. by multicasting). Mobile sta-

tions with a radio interface have been used as a concrete example of mobile terminals, but the invention is equally applicable in a wired packet-switched telecommunications network. Thus, the invention is not limited to these examples or the terms used, but it may vary within the scope of the appended claims.

References:

1. Co-assigned Finnish Patent Application FI982215, titled *"Menetelmä älyverkon ohjauspisteen ja kytkentäpisteen välisen yhteyden ylläpitämiseksi tietoliikennejärjestelmässä ja tietoliikennejärjestelmä"*, filed 12th October 1998.

2. Co-assigned Finnish Patent Application FI982128, titled *"Älyverkkopalvelut pakettivälitteisessä verkossa"*, filed 1st October 1998.

Claims

1. A method for transferring information, such as a new service, or at least information about the new service, by a server (14) to a mobile terminal (MS) in a predetermined area of a packet-switched network (HPLMN, VPLMN) comprising a plurality of support nodes (SGSN, GGSN);

characterized by the steps of:

associating at least one identifier (IMSI) of the mobile terminal (MS) with a Packet Data Protocol address, or PDP address of the same mobile terminal;

operationally connecting the server (14) and all support nodes (SGSN, GGSN) in said predetermined area to an intelligent network node (SCP);

informing (2-6) the intelligent network node (SCP) about the identifier (IMSI) and the current PDP address of the mobile terminal (MS); and

using the PDP address stored in the intelligent network node (SCP) for routing (2-10 ... 2-14) said information to the mobile terminal (MS).

2. A method according to claim 1, characterized in that the using step comprises the following steps:

before transferring said information to the mobile terminal (MS), the server (14) sends to the intelligent network node (SCP) an inquiry (2-10) requesting the PDP address of the mobile terminal (MS); and

in response to the inquiry (2-10), the intelligent network node (SCP) sends to the server (14) the PDP address of the mobile terminal (MS);

whereby the server (14) is able to communicate (2-14) with the mobile terminal (MS) using the PDP address indicated by the intelligent network node (SCP).

3. A method according to claim 1, characterized in that the using step comprises the following steps:

the server (14) sends (2-10') the information to the intelligent network node (SCP); and

the intelligent network node (SCP) sends (2-12') said information to the mobile terminal (MS) without disclosing the mobile terminal's PDP address to the server (14).

4. A method according to claim 1, characterized in that the using step comprises the following steps:

the intelligent network node (SCP) stores, in addition to the PDP address, an address of at least one server (14); and

upon receiving the current PDP address of the mobile terminal (MS), the intelligent network node (SCP) sends the current PDP address to the at least one server (14);

whereby the server (14) is able to communicate with the mobile terminal (MS) without a separate inquiry.

5. A method according to any one of the preceding claims, characterized in that the address of the intelligent network node (SCP) is stored with the subscription data related to the mobile terminal (MS).

6. A method according to any one of the preceding claims, characterized in that the step of informing the intelligent network node (SCP) is responsive to a detected establishment and/or change in the PDP address.

7. A method according to any one of the preceding claims, characterized in that the step of informing the intelligent network node (SCP) is performed by a Serving GPRS Support Node (SGSN) having Service Switching Point (SSP) functionality.

8. A method according to any one of the preceding claims, characterized in that said packet-switched network (HPLMN, VPLMN) communicates with said mobile terminal (MS) over a radio interface.

9. A Service Control Point (SCP), characterized in that,

for transferring information, such as a new service, or at least information about the new service, by a server (14) to a mobile terminal (MS) in a packet-switched network (HPLMN, VPLMN) comprising a plurality of support nodes (SGSN, GGSN), the Service Control Point (SCP):

is operationally connected to the packet-switched network (HPLMN, VPLMN) and the server (14);

is adapted to store said at least one identifier (IMSI) and the PDP address of the mobile terminal (MS) in response to a first message (2-6) originating from the packet-switched network; and

is adapted to support said transferring of information by a server (14).

10. A Service Control Point (SCP) according to claim 9, characterized in that the Service Control Point (SCP) is adapted to receive a second message (2-10) from the server (14), and respond to the second message (2-10) by sending (2-12) to the server (14) the PDP address of the mobile terminal (MS).

11. A Service Control Point (SCP) according to claim 9, characterized in that the Service Control Point (SCP) is adapted to receive from the server (14) a second message (2-10') comprising said information, and respond to the second message by sending (2-12') to the mobile terminal (MS) said information.

12. A Service Control Point (SCP) according to claim 9, characterized in that the Service Control Point (SCP) is adapted:

to store, in addition to the PDP address, an address of at least one server (14); and

upon receiving the current PDP address of the mobile terminal (MS), to send the current PDP address to the at least one server (14).

13. A server (14) for providing a new service, or at least information about the new service, to a mobile terminal (MS) having a Packet Data Protocol address, or PDP address, in a packet-switched network comprising a plurality of support nodes (SGSN, GGSN), wherein each support node has a respective address;

characterized in that the server (14):

is operationally connected to a Service Control Point (SCP) of an intelligent network;

is adapted to use the PDP address of the mobile terminal (MS) stored in the Service Control Point (SCP) for providing the mobile terminal (MS) with a new service or information about it.

14. A server according to claim 13, characterized by being adapted to send the Service Control Point (SCP) an inquiry (2-10) about the PDP address of the mobile terminal (MS) before providing (2-12) the mobile terminal (MS) with a new service or information about it.

15. A server according to claim 13, characterized by being adapted to send (2-10') the new service, or at least information about it, to the Service Control Point (SCP), for forwarding to the mobile terminal (MS).

16. A server according to claim 13, characterized by being adapted to send the new service, or at least information about it, to the mobile terminal (MS) using the current PDP address of the mobile terminal (MS) received from the Service Control Point (SCP).

17. Use of a Service Control Point (SCP) of an intelligent network for transferring information, such as a new service, or at least information about it, to a mobile terminal (MS) via a packet-switched network (HPLMN, VPLMN), wherein transferring said information is initiated by an element (14) other than the mobile terminal (MS).

(57) Abstract

A method for providing a new service or information about it by a server (14) to a mobile terminal (MS) in a packet-switched network (HPLMN, VPLMN) comprising several support nodes (SGSN, GGSN). An identifier (IMSI) and a PDP address are allocated to the MS. The intelligent network node (SCP) is informed (2-6) about the identifier (IMSI) and the PDP address of the MS. The PDP address stored in the intelligent network node (SCP) is used for routing (2-10 ... 2-14) the new service to the mobile terminal (MS). The server (14) can e.g. send the intelligent network node (SCP) an inquiry (2-10) requesting the PDP address of the MS, and the IN node (SCP) can send to the server (14) the PDP address of the MS, whereby the server (14) is able to communicate with the MS using the PDP address indicated by the intelligent network node (SCP).

(Fig. 2A)

Fig. 1

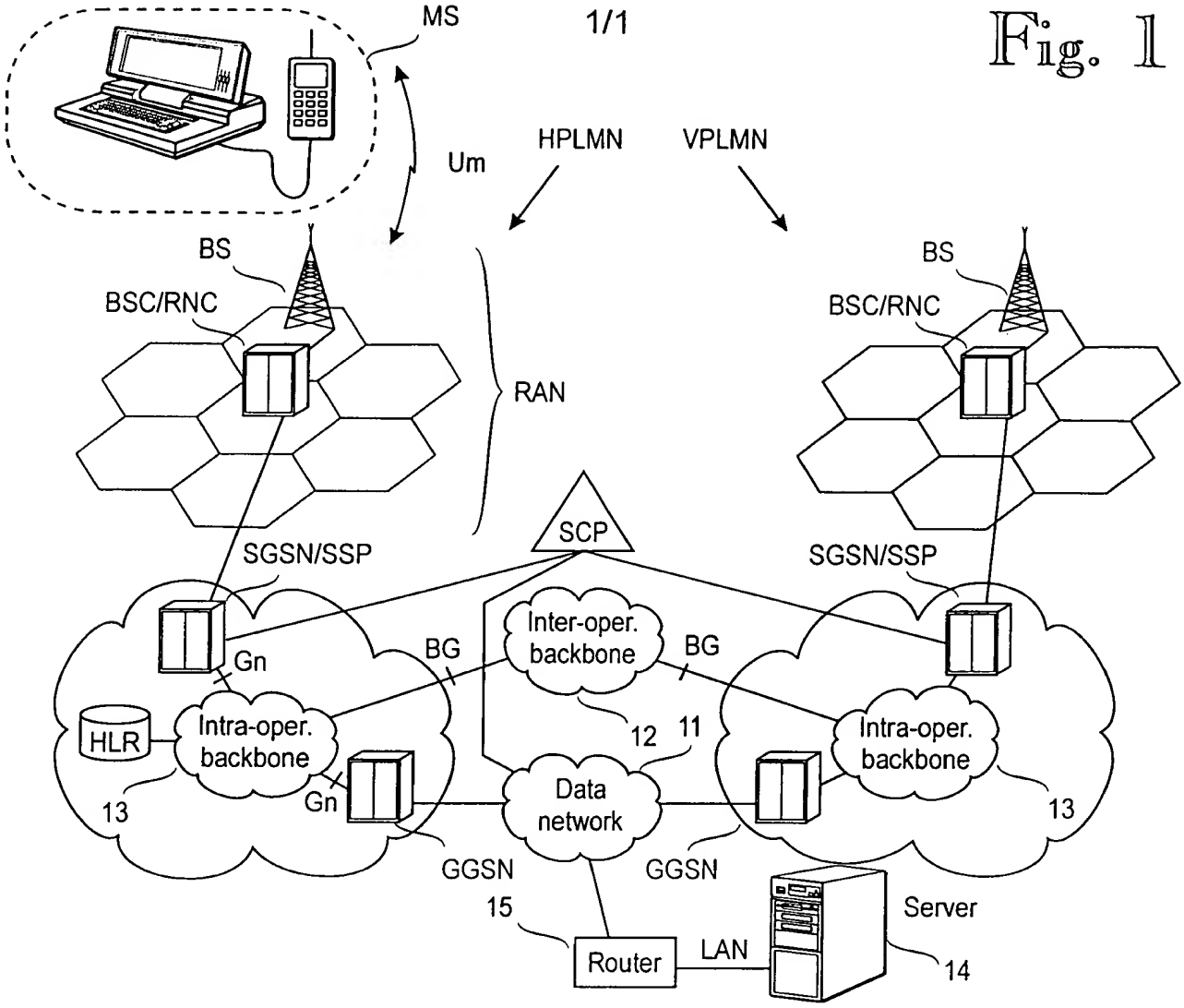

Fig. 2A

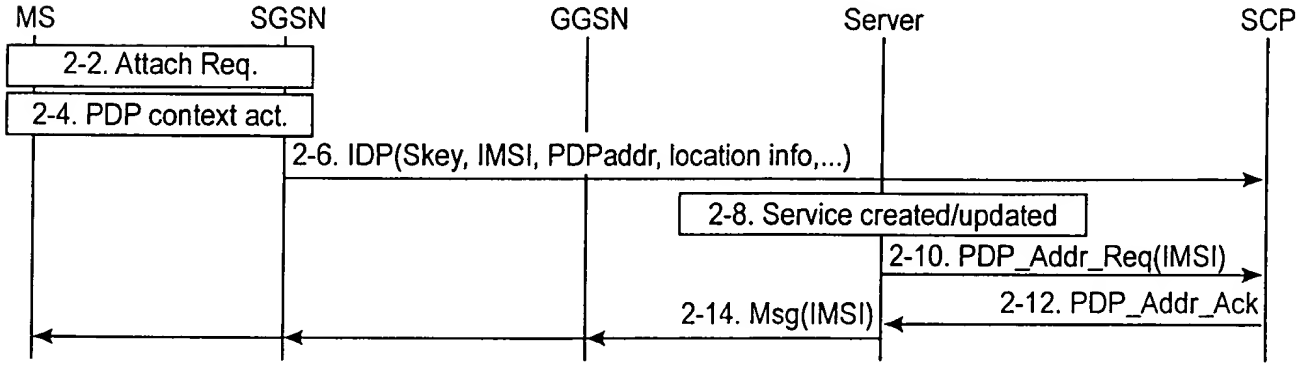

Fig. 2B